product modification

050-0479-01
M15344
M14338
Type 544/RM, 546/R546
547/RM,556/R556

DISCONNECT DIODE REPLACEMENT

For the following TEKTRONIX® Type Oscilloscopes:

Type 544	Serial Numbers	100-2239
Type R544	Serial Numbers	100-2239
Type 546	Serial Numbers	100-2409
Type R546	Serial Numbers	100-2409
Type 547	Serial Numbers	100-12479
Type R547	Serial Numbers	100-12479
Type 556	Serial Numbers	100-2989 w/exceptions
Type R556	Serial Numbers	100-1989 w/exceptions

Gallium Arsenide diodes, PN 152-0161-00, are no longer available and are replaced with a transistor and associated circuitry in the circuit positions listed below. This kit provides parts to modify only one sweep; order two kits to modify both sweeps in the 546, 547 and 556.

Type	544/R	D286	
Type	546/R	D86	D286
Type	547/R	D86	D286
Type	556/R	D640	D840

NOTE: If the serial number of your instrument is above those listed, or if this kit has been installed, disregard the instructions and use the components contained herein as direct replacements.

© 1959, 1973, Tektronix, Inc.
All Rights Reserved.

3-5-73
Supersedes: 3-10-72

TEKTRONIX, SCOPE-MOBILE and are registered trademarks of Tektronix, Inc.

PARTS INCLUDED IN PARTS REPLACEMENT KIT:

Quantity	Part Number	Description
1 ea	136-0235-00	Socket, 6-contact
1 ea	151-0190-00	Transistor, 2N3904
1 ea	151-0277-00	Transistor, silicon RCA 38510
1 ea	152-0165-00	Diode, silicon
1 ea	152-0185-00	Diode, silicon
1 ea	214-0210-00	Spool w/3 ft. silver-bearing solder
1 ea	308-0400-00	Resistor, WW 18k 5W 5%
1 ea	315-0272-00	Resistor, comp. 2.7k 1/4W 5%
1 ea	315-0102-00	Resistor, comp. 1k 1/4W 5%
1 ea	354-0234-00	Ring, Transistor Socket mounting
1 ea		Tubing, #20 black 162-0504-00 4 in.
1 ea		Wire, #22 solid 176-0122-00 bare 12 in.
1 ea	1-910D	Tag, MODIFIED INSTRUMENT, gummed back

IMPORTANT: When soldering to the ceramic strips, use the silver-bearing solder supplied with this kit.

This kit is divided into four parts:

A.	Types	544, RM544 546, RM546 547, RM547	D286	Page 5
B.	Types	546, RM546 547, RM547	D86	Page 9
C.	Types	556, RM556	D640	Page 13
D.	Types	556, RM556	D840	Page 17

A. TYPE 544, RM544 D286
546, RM546
547, RM547

Refer to Fig. 1 for ceramic strip locations.

( ) 1. Unsolder D286, a diode connected between CSD-22 (CSD-21 in type 544) and CSD-25, or pin 1 of V291.

( ) 2a. If D286 was connected to pin 1 of V291, relocate the end of the resistor from CSD-25 to CSD-26 and remove the bare wire between CSD-25 and CSD-26.

( ) 2b. If D286 was soldered to CSD-25, remove the bare wire between CSD-25 and pin 1 of V291.

( ) 3. Remove the bare wire between CSD-24 and Q303 collector.

( ) 4. Remove the bare wire between CSD-21 and Q303 emitter.

( ) 5. Remove the bare wire between CSE-23 and Q303 base.

( ) 6. Replace the bare wire between CSE-23 and CSE-28 with the 2.7k resistor (R300) from the kit.

( ) 7. Unsolder the leads from Q284 socket.

( ) Remove Q284, 151-0108-00 and replace the three-pin Q284 socket with the six-pin socket from the kit. The key goes toward CSD. In early instruments with screw-mounted transistor sockets, use the plastic transistor socket mounting ring from the kit. (See Fig. 2)

( ) 8. Relocate the leads from CSE-26 to CSE-25 and the leads from CSE-25 to CSE-26.

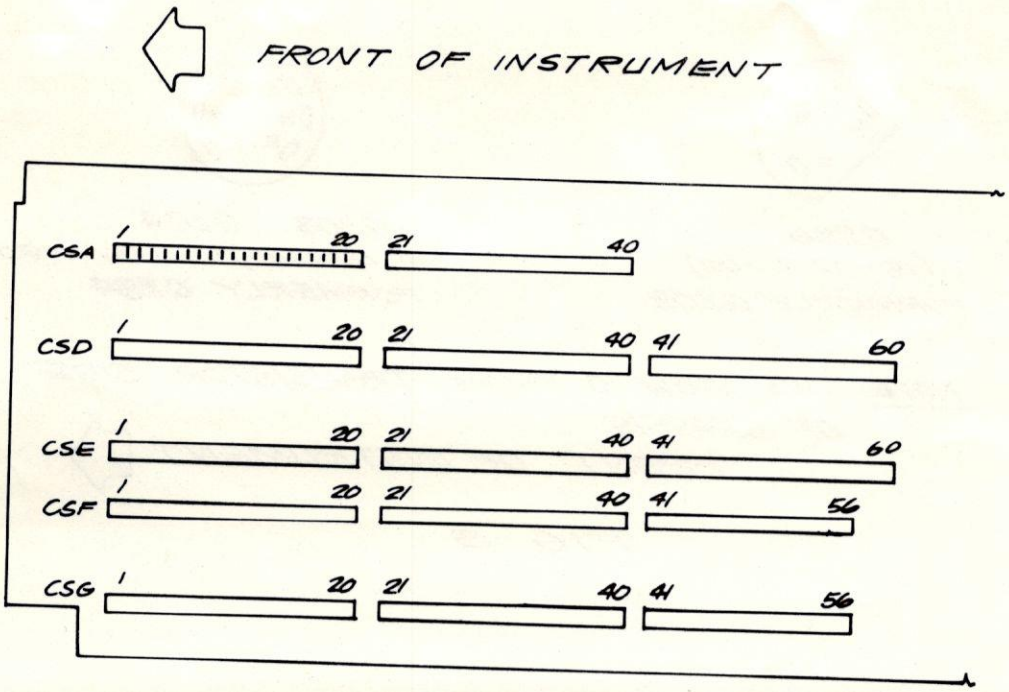


FIG. 1

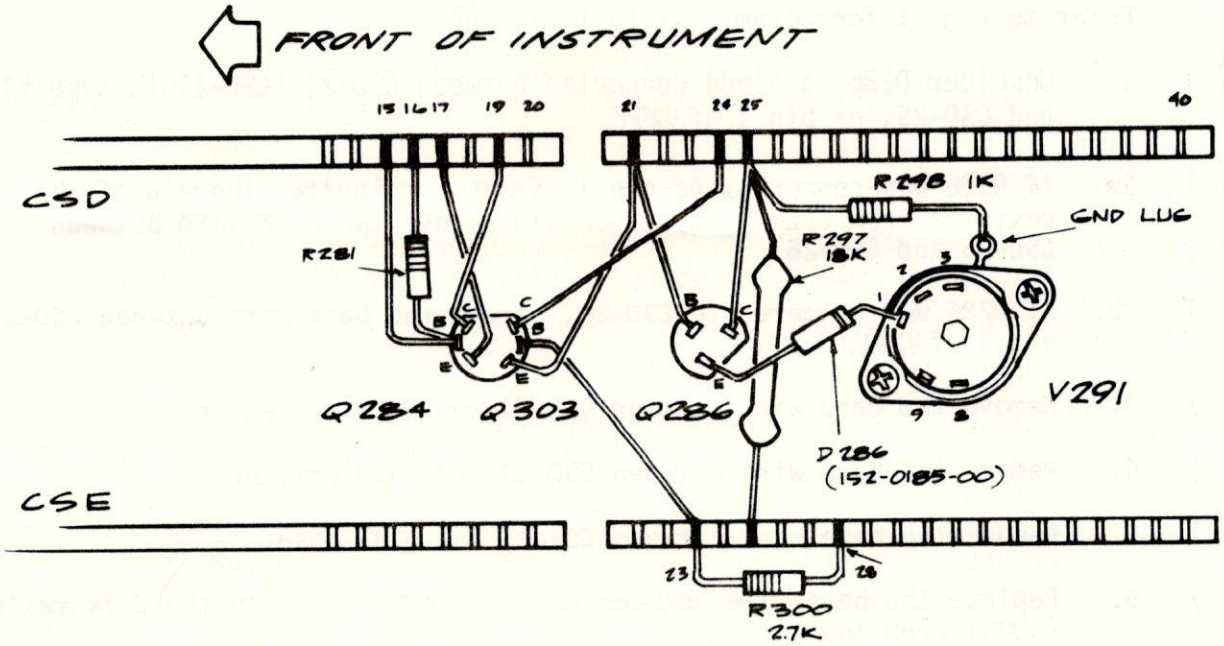
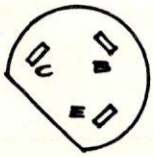


FIG. 2



Q286
(151-0277-00)
FORMERLY Q303

Q303 Q284
(NOT CHANGED) (151-0190-00)
FORMERLY Q284

NOTE: THIS VIEW IS FROM TRANSISTOR SIDE OF CHASSIS

FRONT OF INSTRUMENT

FIG. 3

( ) 9. Remove the "Q303" silkscreening from both sides of the chassis using lacquer thinner or similar solvent. When modification is completed Q303 will share the Q284 socket, and Q286 will occupy the former Q303 socket. The chassis may be marked accordingly if desired. (See Figs 2 and 3).

REFER TO FIG. 2 FOR STEPS A-10 THROUGH A-19.

10. Solder the leads to the six-pin socket as indicated below and in fig. 2:

( ) Bare wire from CSD-19 to Q284 collector.

( ) Bare wire from CSD-15 to Q284 base.

( ) 100 or 180Ω resistor (R281, unsoldered in step A-7) from CSD-16 to Q284 base.

( ) Bare wire from CSD-17 to Q284 emitter.

( ) 11. Solder a 152-0185-00 diode (D286, from kit) between pin 1 of V291 (cathode end) and Q286 emitter. (See fig. 2).

( ) 12. If not already present, solder a 152-0165-00 diode (D291, from kit) between a ground lug on V291 socket (cathode end) and pin 1 of V291 (not shown in fig. 2).

( ) 13. Solder a 1k 1/4W resistor (R298, from kit) from a ground lug on the V291 socket to CSD-25.

( ) 14. Solder a bare wire from Q286 collector to CSD-25.

( ) 15. Solder a bare wire from Q286 base to CSD-21.

( ) 16. Solder a bare wire from Q303 collector to CSD-24.

( ) 17. Solder a bare wire from Q303 emitter to CSD-21.

( ) 18. Solder a bare wire from Q303 base to CSE-23.

( ) 19. Solder an 18k resistor (R297, from kit) between CSD-25 and CSE-25.

( ) 20. Remove transistor Q303 from its former socket.

( ) Install transistor Q303 (removed above) and Q284 (151-0190-00, from kit) in the six-pin socket as indicated in Fig. 3.

( ) 21. Install transistor Q286 (151-0277-00, from kit) as indicated in Fig. 3. If the transistor has four leads, clip off the fourth (case) lead.

THIS COMPLETES THE INSTALLATION.

( ) Moisten the back of the MODIFIED INSTRUMENT tag (from kit) and attach it to the proper Sweep Generator Schematic.

( ) Fasten the Insert pages in your Instruction Manual.

( ) Recalibrate the sweep timing as indicated in your Instruction Manual.

B. TYPE 546, RM546 D86
547, RM547

Refer to Fig. 4 for ceramic strip location.

( ) 1. Unsolder and remove D86 located between CSA-28 and CSA-30 or between CSA-27 or CSA-28 and pin-1 of V91.

( ) If D86 was connected between CSA-28 and CSA-30 remove the bare wire between CSA-30 and pin-1 of V91.

( ) 2. For Types 546 SN 100-962, RM546 SN 100-499 and 547 or RM547 SN 100-6739.

Unsolder the end of R82 at CSA-21 (to be reconnected in later step to new Q84 socket) and remove the bare wire between CSA-21 and Q84 base.

( ) 3. Unsolder and remove the following bare wires:

( ) Between CSA-27 and Q103 emitter.

( ) Between CSA-29 and Q103 base.

( ) Between CSB-31 and Q103 collector.

( ) 4. Unsolder the leads from Q84 socket.

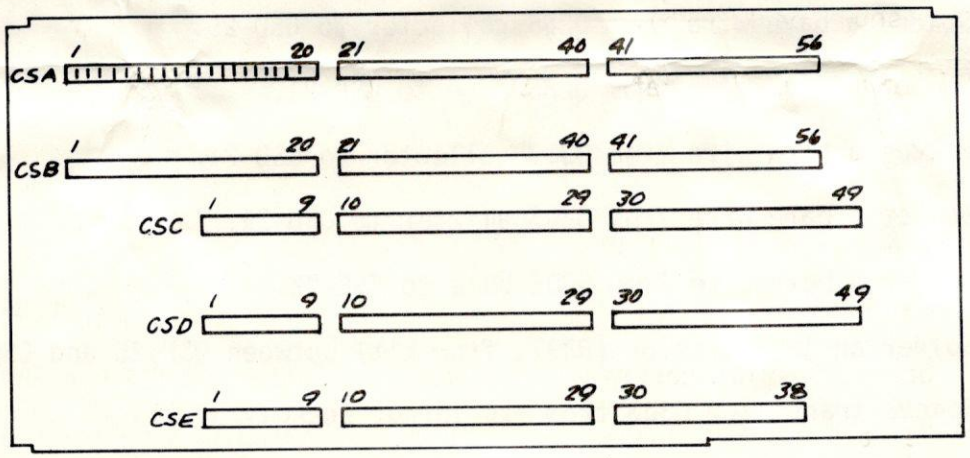


FIG. 4

REFER TO FIG. 5 FOR STEPS B-5 THROUGH B-19.

( ) 5. Remove Q84, and replace the 3 pin Q84 socket with the six-pin socket from the kit. The key goes toward CSA. In early instruments with screw mounted transistor sockets, use the plastic transistor socket mounting ring from the kit. (See Fig. 5)

( ) 6. Remove the "Q103" silkscreening from both sides of the chassis using lacquer thinner or similar solvent. When the modification is completed Q103 will share the six-pin Q84 socket, and Q86 will occupy the former Q103 socket. The chassis may be marked accordingly if desired. (See Figs. 5 and 6).

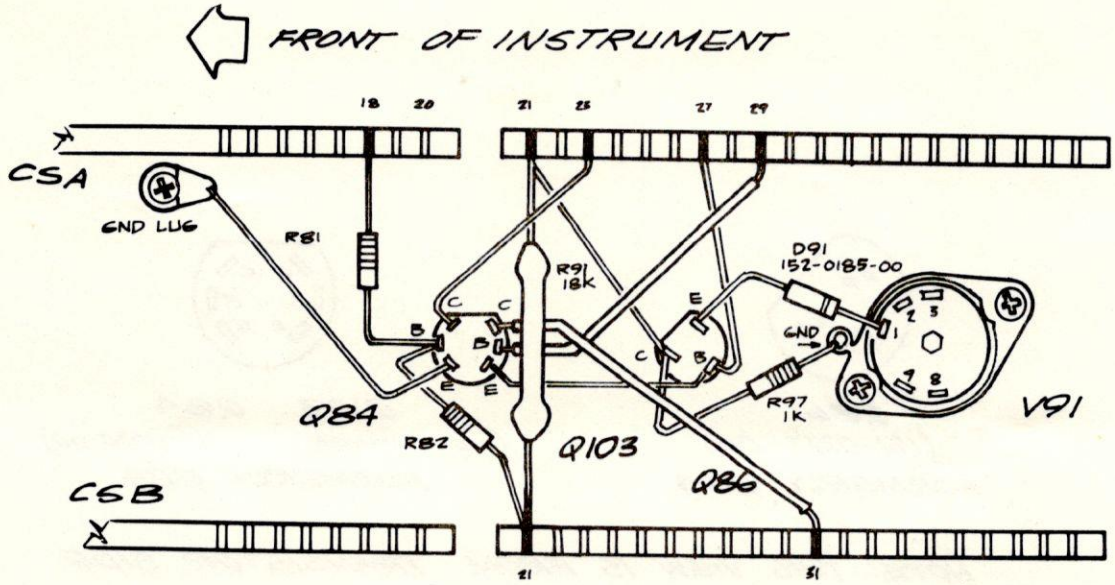


FIG. 5

( ) 7. Solder a 152-0185-00 diode (D86, from kit) between Q86 emitter and pin 1 of V91 (cathode end).

( ) 8. If not already present, solder a 152-0165-00 diode (D91, from kit) between a ground lug on V91 socket (cathode end) and pin 1 of V91 (not shown on Fig. 5).

( ) 9. Solder a bare wire between CSA-27 and Q86 base.

( ) 10. Solder a bare wire between CSA-21 and Q86 collector.

( ) 11. Solder a 1k resistor (R97, from kit) between Q86 collector and a ground lug on the D91 socket.

( ) 12. Solder bare wire (from kit) between Q103 emitter and Q86 base.

( ) 13. Solder a sleeving-covered wire (from kit) between Q103 base and CSA-29.

( ) 14. Solder a sleeving-covered wire (from kit) between Q103 collector and CSB-31.

( ) 15. Solder the end of 100 or 180Ω resistor (R81, unsolder in step B-4) to Q84 base.

( ) 16. Solder the end of the 28.7k or 50k resistor R82,(unsoldered in steps 2 or 4) to Q84 base (other end to CSB-21).

( ) 17. Solder the bare wire from the ground lug near Q84 to Q84 emitter.

( ) 18. Solder the bare wire (from kit) from CSA-23 to Q84 collector.

( ) 19. Solder an 18k resistor (R91, from kit) between CSA-21 and CSB-21.

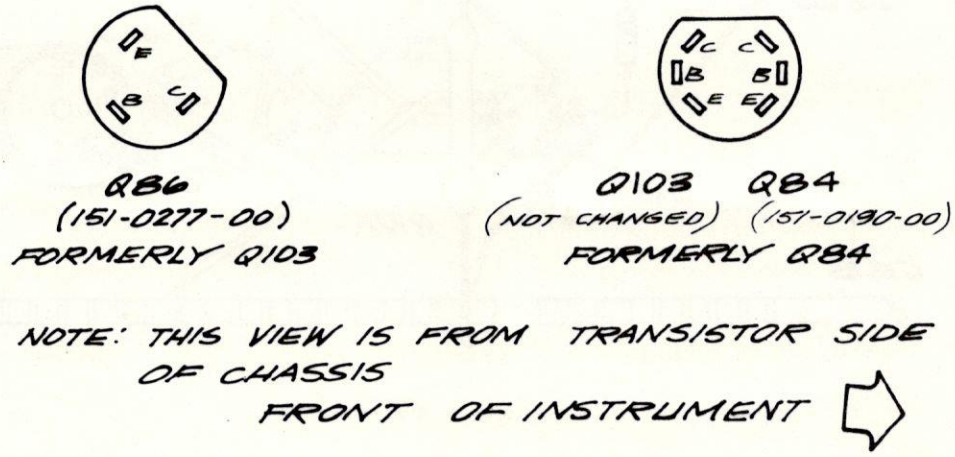


FIG. 6

( ) 20. Remove transistor Q103 from its former socket.

( ) Install transistors Q103 (removed above) and Q84 (151-0190-00, from kit) in the six-pin socket as indicated in Fig. 6.

( ) 21. Install transistor Q86 (151-0277-00, from kit) as indicated in Fig. 6. If the transistor has four leads, clip off the fourth (case) lead.

THIS COMPLETES THE INSTALLATION.

( ) Moisten the back of the MODIFIED INSTRUMENT tag (from kit) and attach it to the proper Sweep Generator Schematic.

( ) Fasten the Insert pages in your Instruction Manual.

( ) Recalibrate the sweep timing as indicated in your Instruction Manual.

C. TYPE 556, RM556 D640

Refer to Fig. 7 for ceramic strip locations.

Remove the rail and components as necessary to gain access to the tansistor sockets.

( ) 1. Unsolder and remove D640, located between CSG-43 and CSH-47, or pin 1 of V661. Remove the rail and capacitor C681 as necessary to gain access.

( ) 2. If D640 was connected between CSG-43 and pin 1 of V661, add a bare wire between CSH-47 and pin 1 of V661.

3. Unsolder and remove the following bare wires:

( ) Between CSG-43 and Q643 emitter.

( ) Between CSH-49 and Q643 base (SN 100-2137, 556 or 100-1067, R556).

( ) Between CSG-46 and Q643 base.

( ) Between CSG-47 and Q643 collector.

( ) Between CSG-43 and CSG-52.

( ) 4. Unsolder the 0.001µF capacitor (C643) from Q643 collector (leave end connected to the ground lug on V661 socket).

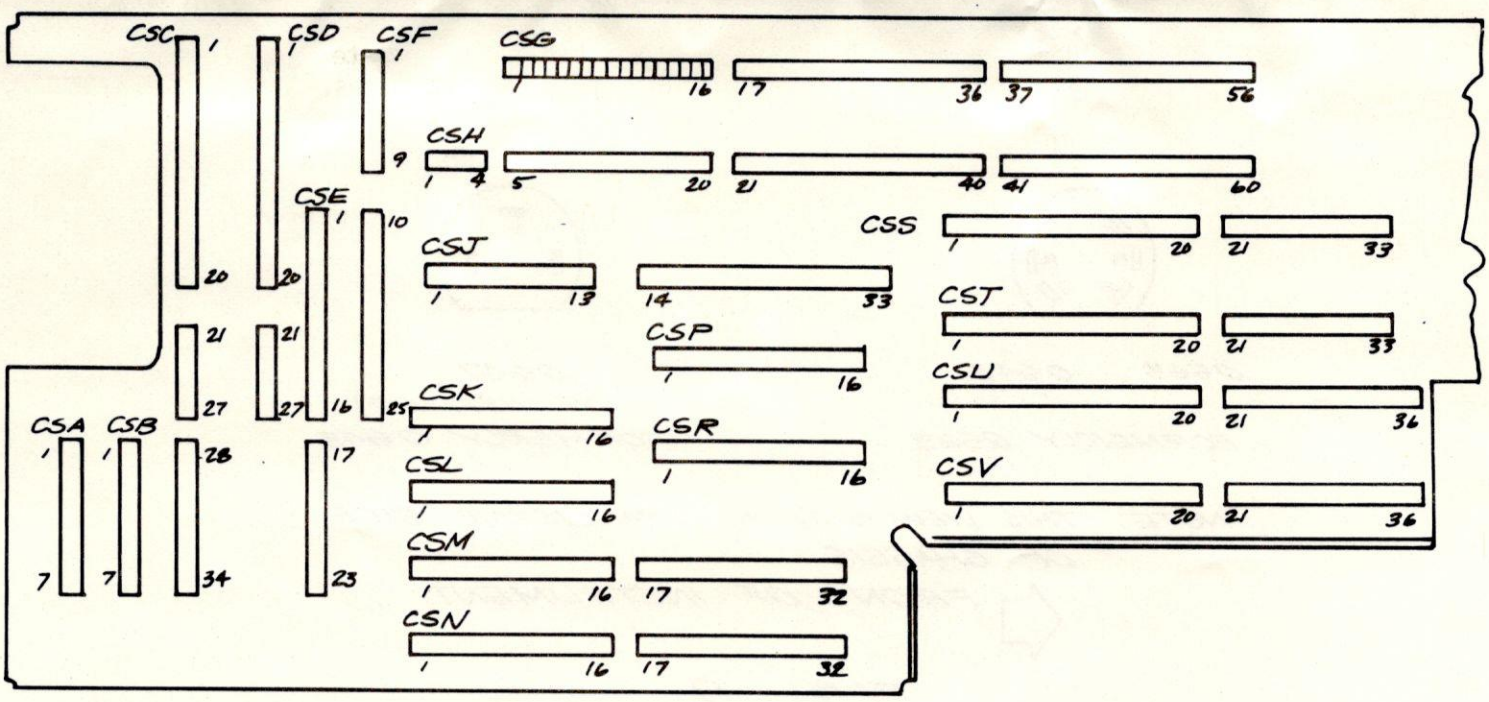


FIG. 7

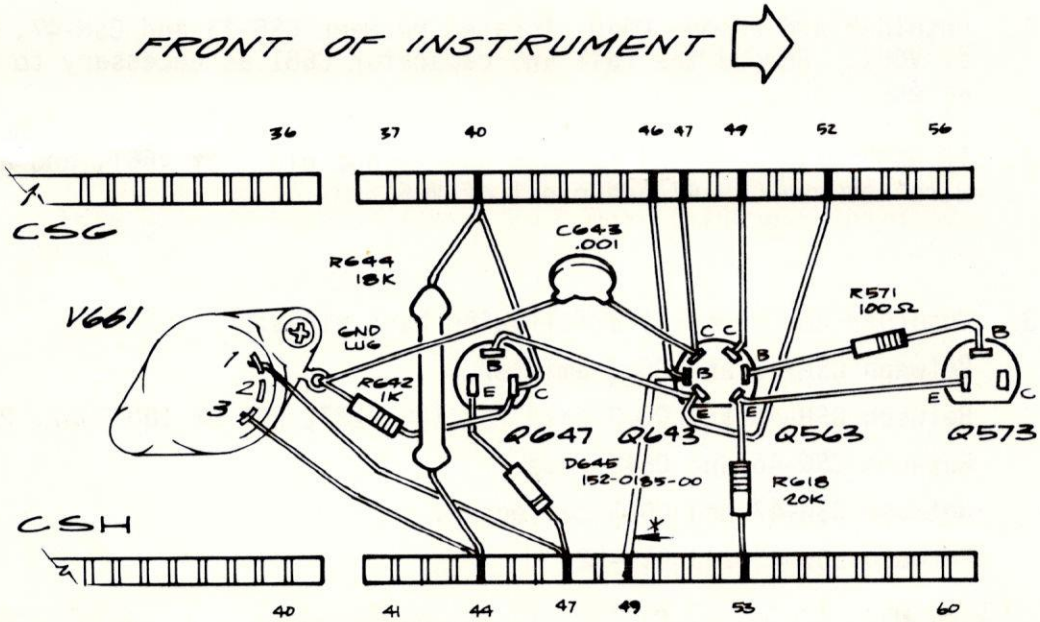
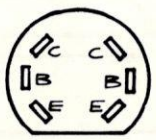


FIG. 8

* S/N 100-2137, 556 OR 100-1067, R556



Q563 Q643

FORMERLY Q563

Q647
(151-0277-00)
FORMERLY Q643

NOTE: THIS VIEW IS FROM TRANSISTOR SIDE OF CHASSIS

FRONT OF INSTRUMENT

FIG. 9

( ) 5. Remove Q563 and unsolder the leads from the three-pin Q563 socket. Remove the socket, and replace it with the six-pin socket from the kit. The flat side goes toward CSH.

( ) 6. Remove the Q643 silk-screening from both sides of the chassis, using lacquer thinner or similar solvent. When the modification is completed Q563 and Q643 will share the six-pin Q563 socket, and Q647 will occupy the old Q643 socket. The chassis may be marked accordingly if desired (see Figs. 8 and 9).

7. Solder the following wires and components as indicated in Fig. 8.

( ) Bare wire (from kit) from Q643 emitter to Q647 and to CSG-52.

( ) Bare wire (from kit) from Q643 base to CSH-49 (SN 100-2137, 556 or 100-1067, R556).

( ) Bare wire (from kit) from Q643 base to CSG-46.

( ) 0.001μF capacitor (C643, unsoldered in step C-4) from Q643 collector to ground lug on the V661 socket.

( ) Bare wire (from kit) from Q643 collector to CSG-47.

( ) Bare wire (from kit) from Q563 collector to CSG-49.

( ) 100Ω resistor (R571) from Q563 base to Q573 base.

( ) 20kΩ resistor (R618) from CSH-53 to Q563 emitter.

( ) Bare wire from Q573 emitter to Q563 emitter.

( ) 8. Solder an 18k 5W resistor (R644, from kit) between CSG-40 and CSH-44.

( ) 9. Solder a 1k resistor (R642, from kit) between Q647 collector and a ground lug on V661 socket.

( ) 10. Solder a 152-0185-00 diode (D645, from kit) between Q647 emitter and CSH-47 (cathode to CSH-47).

( ) 11. Solder a bare wire (from kit) between pin 3 of V661 and CSH-44.

( ) 12. Solder a bare wire (from kit) between Q647 collector and CSG-40.

( ) 13. Remove transistor Q643 from its former socket.

( ) Install transistors Q563 (removed in step C-5) and Q643 (removed above) in the six-pin socket as indicated in Fig. 9.

( ) 14. Install transistor Q647 (151-0277-00, from kit) as indicated in Fig. 9. If the transistor has four leads, clip off the fourth (case) lead.

THIS COMPLETES THE INSTALLATION.

( ) Moisten the back of the MODIFIED INSTRUMENT tag (from kit) and attach it to the proper Sweep Generator Schematic.

( ) Fasten the Insert pages in your Instruction Manual.

( ) Recalibrate the sweep timing as indicated in your Instruction Manual.

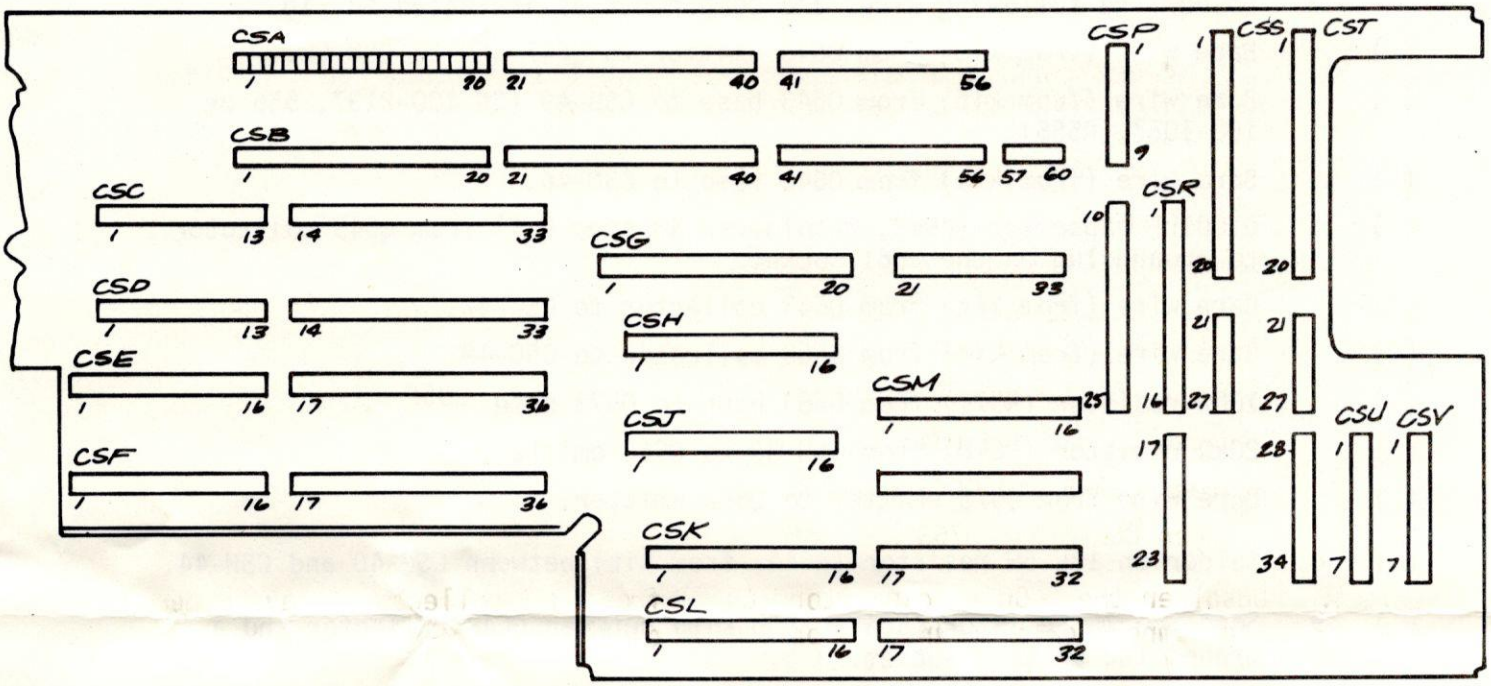

CSA
1
20
21
40
41
56
CSB
1
20
21
40
41
56
57
60
CSC
1
13
14
33
CSD
1
13
14
33
CSE
1
16
17
36
CSF
1
16
17
36
CSG
1
20
21
33
CSH
1
16
CSJ
1
16
CSK
1
16
17
32
CSL
1
16
17
32
CSM
1
16
CSP
1
9
10
CSR
1
16
17
23
25
CSS
1
20
21
27
CST
1
20
21
27
28
34
CSU
1
7
CSV
1
7

FIG. 10

D. TYPE 556, RM556 D840

Refer to Fig. 10 for ceramic strip locations.

Remove the rail and components as necessary to gain access to the transistor sockets.

( ) 1. Unsolder and remove D840, locate between CSA-14 and CSB-14, or pin 1 of V861.

( ) 2. If D840 was connected between CSA-14 and pin 1 of V861, add a bare wire between CSB-14 and pin 1 of V861.

3. Unsolder and remove the following bare wires:

( ) Between CSA-5 and CSA-14.

( ) Between Q763 emitter and Q773 emitter.

( ) Between CSB-12 and Q843 base. (SN 100-2137, 556 or 100-1067, R556) DO NOT REMOVE the jumper between CSB-11 and CSB-12.

( ) Between CSB-11 and Q843 base. (SN2138-up, 556 or 1068-up R556.)

( ) Between CSA-10 and Q843 collector.

( ) Between CSA-5 and Q843 emitter.

( ) Between CSA-8 and Q763 collector.

( ) 4. Unsolder the 0.001μF capacitor (C843) from Q843 collector (leave other end connected to ground lug on V861 socket).

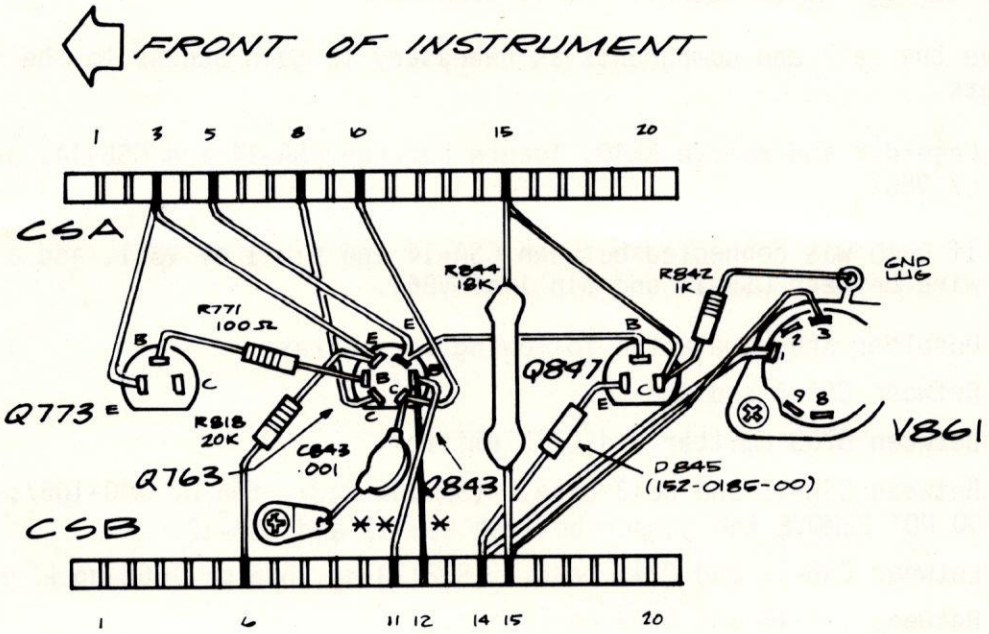
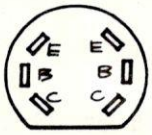


FIG. 11

* S/N 100-2137, 556 OR 100-1067, R556
** S/N 2138-UP, 556 OR 1068-UP, R556

Q847
(151-0277-00)
FORMERLY Q843



Q843 Q763
FORMERLY Q763

NOTE: THIS VIEW IS FROM TRANSISTOR SIDE OF CHASSIS.
FRONT OF INSTRUMENT

FIG. 12

( ) 5. Remove Q763, unsolder the leads from the three-pin Q763 socket, and replace it with the six-pin socket from the kit. The key goes toward CSB.

( ) 6. Remove the 'Q843' silk-screening from both sides of the chassis using lacquer thinner or similar solvent. When the modification is completed Q763 and Q843 will share the six-pin Q763 socket and Q847 will occupy the old Q843 socket. The chassis may be marked accordingly if desired (see Figs. 11 and 12).

7. Solder the following wires and components as indicated in Fig. 11.

( ) A bare wire from Q773 emitter to CSA-3.

( ) A bare wire from Q763 collector to CSA-8.

( ) A 100Ω resistor (R771, unsoldered in step D-5) from Q763 base to Q773 base.

( ) A 20kΩ resistor (R818) from Q763 emitter to CSB-6.

( ) A bare wire from Q763 emitter to CSA-3.

( ) A bare wire from Q847 base and Q843 3mitter to CSA-5.

( ) A bare wire from Q843 base to CSB-12 (SN 100-2137, 556 or 100-1067, R556.)

( ) A bare wire from Q843 base to CSB-11. (SN 2138-up, 556 or 1068-up, R556.)

( ) A bare wire from Q843 collector to CSA-10.

( ) The 0.001μF capacitor (C843, unsoldered in step D-4) to Q843 collector.

( ) Diode D845 (152-0185-00, from kit) between Q847 emitter and CSB-14 (cathode end).

( ) 8. Solder the 1K resistor (R842, from kit) between Q847 collector and a ground lug on the V861 socket.

( ) 9. Solder a bare wire between CSB-15 and pin 3 of V861.

( ) 10. Solder a bare wire between CSA-15 and Q847 collector.

( ) 11. Solder the 18K resistor (R884, from kit) between CSA-15 and CSB-15.

( ) 12. Remove transistor Q843 from its former socket.

( ) Install Q763 (removed in step D-5) and Q843 (removed above) as indicated in Fig. 12.

( ) 13. Install transistor Q847 (151-0277-00, from kit) as indicated in Fig. 12. If the transistor has four leads, clip off the fourth (case) lead.

THIS COMPLETES THE INSTALLATION.

( ) Moisten the back of the MODIFIED INSTRUMENT tag (from kit) and attach it to the proper Sweep Generator Schematic.

( ) Fasten the Insert pages in your Instruction Manual.

( ) Recalibrate the sweep timing as indicated in your Instruction Manual.

DF:jj

INSTRUCTION MANUAL

MODIFICATION INSERT

DISCONNECT DIODE REPLACEMENT

Type 544 -- SN 100-2239
Type R544 -- SN 100-2239
Type 546 -- SN 100-2409
Type R546 -- SN 100-2409
Type 547 -- SN 100-12479
Type R547 -- SN 100-12479
Type 556 -- SN 100-2989 w/exceptions
Type R556 -- SN 100-2980 w/exceptions

Installed in Type_____SN_____Sweep Generator_____Date_____

This insert has been written to supplement the Instruction Manual for these instruments. The information given in this insert will supersede that given in the manual.

This Insert Material Copyright © 1969 by Tektronix, Inc., Beaverton, Oregon. Printed in the United States of America. All rights reserved. Contents of this insert may not be reproduced in any form without the permission of the copyright owner.

GENERAL INFORMATION

Gallium Arsenide diodes, PN 152-0161-00, are no longer available and are replaced with a transistor and associated circuitry in the circuit positions listed below.

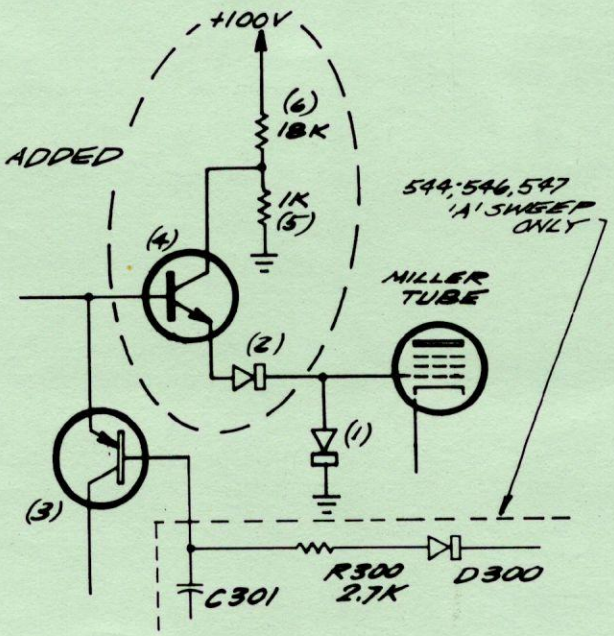
Type	544/R	D286	
Type	546/R	D86	D286
Type	547/R	D86	D286
Type	556/R	D640	D840

CIRCUIT DESCRIPTION:

The circuitry is basically unchanged except that a transistor is used in place of the disconnect diode. When its base goes negative, the transistor cuts off, initiating a sweep. A voltage divider in the collector circuit establishes the collector voltage during cut off. At the end of the sweep, the transistor is turned on and discharges the timing capacitor.

ELECTRICAL PARTS LIST:

	Ckt.No. Types 544,546 547,/R's	Ckt.No. Types 556	Part Number	Description		
				DIODES		
		D640	Delete			
(1)	D90	D641	152-0165-00			
(2)	D86	D645	152-0185-00	Silicon Replaceable by 1N4152		
		D840	Delete			
(1)	D291	D841	152-0165-00			
(2)	D286	D845	152-0185-00	Silicon Replaceable by 1N4152		
				TRANSISTORS		
	Q84		151-0190-00	2N3904		
(3)	Q103	Q643	*			
(4)	Q86	Q647	151-0277-00	RCA 38520		
	Q284		151-0190-00	2N3904		
(3)	Q303	Q843	*			
(4)	Q286	Q847	151-0277-00	RCA 38520		
				RESISTORS		
(6)	R91	R644	308-0400-00	18k	5W	5%
(5)	R97	R642	315-0102-00	1k	1/4W	5%
(6)	R297	R844	308-0400-00	18k	5W	5%
(5)	R298	R842	315-0102-00	1k	1/4W	5%
	R300		315-0272-00	2.7k	1/4W	5%



*Not changed